CLAIMS

1. A control system for an electric motor having a stator and rotor comprising:

an inverter for providing power to the electric motor;

a controller for controlling said inverter;

a low speed control block to estimate the rotor angular position using stator current components operating in said controller;

a high speed control block to estimate the rotor angular position using stator current components and stator flux position operating in said controller;

a transition switch in said controller to vary operation between said low speed control block and said high speed control block; and

wherein said inverter is controlled by six step operation.

2. The control system of Claim 1 wherein said electric motor is an induction motor.

3. The control system of Claim 1 wherein said electric motor is an interior permanent magnet motor.

4. The control system of Claim 1 wherein said electric motor is a synchronous reluctance motor.

5. The control system of Claim 1 wherein said electric motor is a three-phase motor.

6. The control system of Claim 1 further comprising a Gopinath observer.

7. The control system of Claim 1 wherein said transition switch operates said first motor speed control block below ten percent of rated machine speed.

8. The control system of Claim 1 wherein said transition switch operates said second motor speed control block above five percent of rated machine speed.

9. A sensorless method of controlling an electric motor comprising:

providing a low speed rotor angular position block operating in a controller;

providing a high speed rotor angular position block operating in said controller;

providing an initial rotor polarity detection block operating in said controller;

transitioning between said low speed rotor angular position block and said high speed rotor angular position block to determine the speed of the electric motor; and

controlling the speed of the electric motor with six step operation.

10. The method of Claim 9 further comprising operating the electric motor in a vehicle.

11. The method of Claim 9 further comprising the step of determining the rotor magnet position of the electric motor in a static state.

12. A powertrain for a vehicle comprising:

an electric motor functionally coupled to a wheel of the vehicle;

an inverter for providing power to the electric motor;

a controller for controlling said inverter;

a low speed control block to estimate the rotor angular position using stator current components operating in said controller;

a high speed control block to estimate the rotor angular position using stator current components and stator flux position operating in said controller;

a transition switch in said controller to vary operation between said low speed control block and said second high speed control block; and

wherein said inverter is controlled by six step operation.

13. The powertrain of Claim 12 wherein said electric motor is an induction motor.

14. The powertrain of Claim 12 wherein said electric motor is an interior permanent magnet motor.

15. The powertrain of Claim 12 wherein said electric motor is a synchronous reluctance motor.

16. The powertrain of Claim 12 wherein said electric motor is a three-phase motor.

17. The powertrain of Claim 12 wherein said transition module varies operation between said first control module and said second control module based on the speed of the electric motor.

18. The powertrain of Claim 12 wherein the electric motor includes an interior permanent magnet rotor.